

‘Alternative Ways of Being’: Reimagining Locative Media Materiality through Speculative Fiction and Design

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Media Theory
Vol. 3 | No. 2 | 63-102
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<http://mediatheoryjournal.org/>

Abstract

Following the ‘material turn’ in media studies and a growing intersection with posthuman philosophies, theorists and practitioners in the field of ‘locative media’ have recently sought to make more explicit and visible the underlying material infrastructure and processes of location-aware technologies. These approaches, we argue, concentrate on two, interrelated layers of locative media materiality: the ‘infrastructure’ itself and its socio-political consequences; and the material relations between human and non-human elements that act upon one another to create the ‘performance’ of locative media. These approaches offer a vital and necessary challenge to the predominantly human- and user-centric focus of existing locative media studies. To date, however, they have been focused on rendering visible the infrastructure and performance of locative media as it presently exists; and still remain centred around the human body as the site and metaphor for understanding this materiality. In this paper, we further complicate this human centrality around the infrastructural and performative layers of locative media to challenge and reimagine the role of the human in locative media art and practice. Drawing on the traditions of speculative fiction and design, we propose fiction, design, and world-building as methods for developing imaginaries and alternative futures that expand the potential for locative media to be reframed from a non-human centric perspective. Such an approach emphasises creativity and imagination, in addition to purely empirical knowledge of locative technologies and processes; and allows for a more speculative, playful, and questioning approach to this materiality, taking into account not only ‘what is’ but also ‘what could be’. Through a discussion of two experimental projects undertaken by one of the authors of this paper, we advocate opening up locative media studies to encompass speculation about its alternative and future potentialities.

Keywords

Anthropocene, Digital Infrastructure, Locative media, Materiality, Mobile media, New Media Art, Speculative Design, Speculative Futures

‘What is electricity? What is light? We experience these things every day of our lives but what good does it do if we find ourselves hurled back in time and we can’t even tell people the basic principles much less actually make something that would improve conditions? [...] What good is knowledge if it just floats in the air? It goes from computer to computer. It changes and grows every second of every day. But nobody actually knows anything.’
-- Don DeLillo, *White Noise* (1998/1985: 147-9)

Following the ‘material turn’ in media studies (see Herzogenrath, 2015; Lievrouw, 2014; Parikka, 2012), the field of ‘locative media’ has recently undergone a similar shift as theorists and artists unravel the implications of GPS infrastructure and location-aware technologies.¹ Locative media first emerged in the early 2000s as a descriptor for the artistic practices and intellectual discourse around location-aware technologies’ potential to transform everyday life. As Jason Farman (2015: 51) notes, scholarship on locative media has largely consisted of social science approaches that focus on the interfaces of locative technologies and the interactions between their users, overlooking the more complex assemblage of material infrastructure that underpin them. Recently, numerous scholars and artists have sought to redress this by explicating the often hidden, obfuscated, or repressed presence of locative media technologies. They draw attention to the infrastructural ecology of locative technologies: cell phone towers, antennas, servers, satellites, monitoring stations, and electromagnetic signals. They also critique the protocols, regulations, technical affordances, glitches, and human labour that govern and underpin this infrastructure. Scholars such as Farman, Frederica Timeto (2014), and Ned Rossiter (2016), along with artists like Simon Faithfull, Mark Shepard, and Nikki Pugh, have sought to render visible these material objects and practices through theoretical and artistic interventions.

These interventions in the scholarship and practice of locative media have made significant strides towards remedying this deeply-ingrained neglect and obfuscation of their materiality. As we discuss in this article, however, despite adopting materialist and speculative realist approaches to locative media, such approaches consistently return – and remain tethered to – the human body as the primary site and metaphor for understanding locative media’s materiality. As such, we seek to expand the existing scholarship on this topic by raising other possibilities for considering them outside the everyday ‘performance’ that unfolds around human bodies. We draw on the traditions of speculative fiction and speculative design to rethink the relationship between

humans, objects, animals, the environment, and locative media. We propose fiction, design, and world-building that is rooted in these traditions as methods for developing imaginaries and alternative futures that further explicate the implications of locative media from a non-human centric perspective – while also acknowledging the perhaps inescapable end-point of this human-centricity.

Incorporating speculative fiction into locative media studies offers two overarching benefits. First, it renders visible the materiality of locative media in a way that builds on the work already undertaken by theorists and artists, but through creative rather than purely theoretical or empirical means. Narrative, imagination, and metaphor play a greater role, allowing humans to think more widely and openly about the materiality of locative technologies. Second, it allows for a richer and more open-ended understanding of this materiality, opening critiques of locative media infrastructure beyond 'what is' to 'what could be', by encouraging speculation about future and alternative applications of this infrastructure – rather than just existing ones (see Galloway, 2013).

The paper begins with a necessarily brief overview of the scholarship on locative media and how it has more recently been challenged by both theorists and artists from Actor Network Theory (ANT), non-representational theory, object-oriented ontology, and related approaches. We then outline speculative fiction and speculative design, as articulated by Anthony Dunne and Fiona Raby (2013), as methods for building on these critiques. Through this approach we aim to shift the focus away from a ground-level, human-centric perspective on locative media's materiality to a more conceptual, imaginative, and speculative one. The final section discusses two projects, designed by one of the authors of this paper, which explore how this approach can be applied in practice.

Towards a Materiality of Locative Media

The term 'locative media' was coined, as Andrea Zeffiro (2012: 251) notes, in 2003 by Karlis Kalnins at the Art+Communication Festival in Riga. It sought to describe and capture an emerging avant-garde movement or artistic practice premised on experimentation with mobile and location-aware technologies. Locative media served

as an umbrella term encompassing the body of work being produced by artists, theorists, and developers utilising these devices – mobile phones, PDAs, laptops, GPS trackers – to reconceptualise and critique the relationship between people, networked communication technologies, and the everyday environment. The various genres and applications of locative media have been documented in an extensive body of scholarly literature since the mid-2000s (see for instance de Souza e Silva and Frith, 2012; Farman, 2012; Hemment, 2006; Tuters & Varnelis, 2006; Zeffiro, 2006, 2012). As this article is primarily concerned with intervening in debates around locative media rather than rehashing them, we refer readers unfamiliar with locative media practice and theory to this literature. However, it is important for the context of this article to briefly ruminate on the term ‘locative media’ itself and critique how it has been conceptualised and examined within academic and artistic discourse.

Since its inception, the term locative media has been imbued with symbolic meaning and importance. The term is derived from the locative noun case in the Latvian language, which roughly corresponds to the English words ‘in’, ‘on’, ‘at’ or ‘by’ and refers to the final location or time of an action. As Kalnins (2004: n. p.) explains, it is a decidedly apt term for location-aware devices that use GPS technology, given ‘GPS devices are useful for not just geographical coordinates but also for obtaining very accurate time from orbiting atomic clocks’, emphasising the fact that these devices (and the projects that use them) are ‘not just about location’. The use of the Latvian locative case is also a gesture to the place where the term itself was coined – Riga – neatly bringing everything back full circle, drawing attention to both the intellectual environment in which the term originated and its temporal and spatial meanings.

The symbolic importance of this term becomes clearer through a glance at the various definitions ascribed to it. Locative media has been described as a ‘field of cultural production’ (Zeffiro, 2012); a ‘site’, ‘framework’ and ‘context’ (Russell, 2004); a ‘genre of projects’ (Flanagan, 2007: 1) and a ‘philosophy’ (Cubitt, 2007: 1152). Moreover, as Zeffiro (2012) recounts, it has been articulated, contested, and redefined through numerous online forums, message boards, and artists’ workshops, where debates about its potential ranged from techno-utopian euphoria to dystopian anxiety, and everything in between. Locative media is clearly much more than simply a descriptor for the set of technologies and infrastructure that enable location-aware media practices. It is

thickly layered with symbolic meaning, conceptual baggage, and an array of sometimes conflicting notions about how it is to be defined and understood.

Since it was coined, the scholarship on locative media has undergone two overarching and overlapping phases. The first, early phase concerns the attempts to define and debate its social and political impact. These largely took place during, and in the years after, the period when the term was coined. This literature encompasses discussions on forums, listservs, and workshops such as *CRUMB*, *[LOCATIVE]* and *N5M (Next Five Minutes)*, as documented by Zeffiro (2012); formative texts like Ben Russell's *beadmap manifesto* (1999; see also Leorke, 2017) and the *Transcultural Mapping Reader* (2004); and articles in various books and special issues of journals like *Convergence* and *Leonardo Electronic Almanac* (see de Souza e Silva & Frith, 2012; de Souza e Silva & Sheller, 2014; Gordon & de Souza e Silva, 2011; Farman, 2012; Hemment, 2006; Tuters and Varnelis, 2006; Wilken and Goggin, 2014). These texts were primarily concerned with defining the meaning of the term; cataloguing the different types of locative media projects; debating the implications of the technology (often from either a celebratory or pessimistic viewpoint); and speculating on its future possibilities.

The second phase of locative media scholarship concerns the body of literature that first began to emerge in the mid-2000s (see in particular de Souza e Silva, 2006) examining the impact of location-based technologies on sociability and social interaction in everyday public space. Taking their cue from 20th Century scholars of social interaction – from Weber and Simmel to Goffman and Sennett – these scholars concentrate on theorising and reconceptualising how users of location-aware technologies interact with one another and the physical environment around them. This research also often contains an empirical component, such as interviews, surveys, or ethnographic observation of locative media users (see e.g. Humphreys, 2007; Licoppe and Inada, 2006, 2008; Özkul, 2014; Raanan & Shovel 2014; Saker and Evans, 2016; Schwartz & Haleguoa, 2015).

These social science approaches to locative media have proven highly valuable and necessary for unpacking their social impact. But, as scholars like Farman argue, they have contributed to a largely human-centric approach to locative media that often effaces or ignores the role played by the technological infrastructure itself. Farman points out that most locative media scholarship tends to focus on 'human-to-human

connectivity', viewing the location-aware devices and infrastructure as 'an extension of social media sites like Facebook' into the streets and everyday environment (2015: 51). Referring to ubiquitous computing, Anne Galloway points to the tendency for scholars to 'privilege the technology or the people who use it,' overlooking 'the assemblages or associations amongst all the humans and nonhumans involved in the production and consumption of new technologies and media' (2013: 55). And Ned Rossiter (2014: 210) echoes this point in relation to the infrastructure in which locative technologies are embedded, arguing that:

at the conceptual and empirical levels, research on locative media has next to nothing to say about logistical media and supply chain operations whose spatial-temporal operations are frequently enough overseen by locative media – GPS, RFID, voice picking technology, ERP systems, social media software, etc.

Exceptions to such oversights do exist, with some formative locative media scholars touching on the history and technical infrastructure of GPS (see for instance Gordon & de Souza e Silva, 2011: 41; Zeffiro, 2006: 305). But by and large they establish only a rudimentary understanding of the basic components of locative media, while assuming that their infrastructure is fixed and stable, operating in a generic and predictable fashion. It is impossible to ascertain, of course, how dominant this bias is within the literature on locative media, let alone more broadly outside scholarship, without an exhaustive discourse analysis – something outside the scope of this article. But a simple examination of the term 'locative media' itself indicates how deeply rooted these assumptions about its materiality are. As we noted above, the term has served as something of a vehicle for debates about, and imaginaries around, the potential – both utopian and dystopian – of location-aware technologies. It is also a convenient umbrella for discussing and debating these technologies' emergent possibilities. But in the process, it assimilates the much more diverse array of devices, cables, telecommunications infrastructure, and GPS satellites that underpin locative media into a single, homogenous technological apparatus: 'locative media'. In the process, it downplays the myriad technologies and infrastructure that make locative media possible – as well as the unevenness, disjuncture, and disconnection that frequently characterise them. Even though locative *media* is plural, it is mostly deployed

as a singular term to encompass these multifarious infrastructures. Even within the very terminology used to describe them, the material devices and infrastructures of locative technologies are – unconsciously or otherwise – stripped of agency, autonomy, and specificity.

As noted, other scholars and practitioners of locative media have already pointed out and begun to address this oversight in their work. True to the origins of locative media as both a theoretical paradigm and an avant-garde artistic movement, both academics and artists have driven this shift. Their approaches broadly fall into two categories, which we briefly outline in the remainder of this section: 'infrastructural' and 'performative' critiques. 'Infrastructural' critiques concern the numerous technologies that enable locative media to exist, from GPS satellites orbiting more than 20,000 kilometres above the Earth's surface to the cell phone towers, fibre optic cables, and control centres that mediate and convey the electromagnetic signals of these satellites. 'Performative' critiques seek to emphasise the way locative media itself can be considered a performance – what Timeto describes as 'an unfolding environment traversed by mobile interfaces that actively mediate the networks of sociospatial relations' (Timeto, 2014: 100). We briefly outline these critiques here. It is important to note at the outset of our discussion of these critiques that they are not distinct but overlapping and interconnected – although scholars and artists have tended to subtly emphasise one aspect or the other.

Satellites and Towers: The Infrastructure of Locative Media

A full and comprehensive description of locative media and location-aware networks and their material presence on Earth (and beyond) would be an exercise in futility. Locative technologies, and the infrastructure that make them possible, are now so vital to human social, political, and economic activity that, as Greg Milner (2016: 101) postulates, their sudden collapse would cause irreversible economic and social disruption, setting human progress back at least several decades. Yet beyond a recognition of GPS's military origins and basic functionality, until recently locative media scholarship has paid scant attention to this infrastructure behind the user-level interface of devices connected to it.

Jason Farman's recent work (2015, 2016, 2017) has been instrumental in challenging this oversight by arguing for a stronger engagement with the materiality of locative media. He notes how, on a fundamental level, the infrastructure that make location-aware technologies possible are designed – deliberately or otherwise – to recede into the background by those responsible for their design and implementation: planners, engineers, the military, and technology vendors. Fibre-optic cables are buried underground. Cell towers are often disguised as trees or blended into nearby architecture to remain out of sight. And the command and control centres that operate the GPS satellite constellation are located in remote, military-patrolled facilities off-limits to most civilians. This gives rise, Farman (2015: 57) notes, to a contradiction between the functionality of locative media infrastructure – which relies on line-of-sight visibility between towers and devices – and the aesthetic design of the devices that connect to it, which aim to appear seamless, intuitive, and ever-present. Locative media is rendered ubiquitous, in the sense conveyed by Mark Weiser's (1991) theory of ubiquitous computing: always on-hand, but designed to fade into the background.

This dual, contradictory approach to the design and rollout of locative media technologies represents an ideological desire to overcome their 'otherness', in the process repressing the 'political consequences' such objects play in the way people 'practice space, identity and community creation' (Farman, 2015: 57). In other words, the infrastructure behind locative media are rendered invisible from the very points at which they are implemented not only for aesthetic purposes, but because those responsible for them – governments and large companies – do not wish to draw attention to the processes that go into their design and operation. These range from the military sensitivity of GPS satellites to the often exploitative conditions in which most smartphones are produced. Going against this tendency, then, is to undertake a political economic critique as much as it is an exercise in technical description. By challenging these attempts to render technology as invisible and 'other', Farman contends that scholars (and ultimately users) can examine more openly the political implications of locative media infrastructure: the labour behind such technologies, the technical and regulatory infrastructure that keep them operating, and users' own consumption patterns and decisions.

Farman's sentiment is echoed by other work from outside locative media studies. Lisa Parks' work on satellites, for instance, highlights their omnipresent, almost unconscious presence in people's lives. She points out that they deliver live news feeds, directions to nearby landmarks, and, today, streamed content to our phones despite virtually no understanding by users about how they work or who controls them. Satellites exist 'beyond the horizon of everyday visibility' at both the extra-terrestrial level, she writes, where they orbit the Earth mostly invisible to the naked eye; and the ground level, where they are operated from highly restricted military bases in remote, inaccessible locations. As a result, Parks argues, 'publics around the world have both been excluded from and/or remained silent within important discussions about their ongoing development and use' (Parks, 2007: 207).

Building on Parks' work, Stephen Graham (2016) argues for the need to 'penetrate' this elusive and secretive nature of satellites. He points to the work of artists and activists like Trevor Paglen and Steve Rowell who track and photograph military satellites in the sky, and the military bases that control them, rendering visible these highly sensitive infrastructure (see Graham, 2016: 32-7). These strategies of 'watching the watchers' that Graham describes are more political incarnations of the tradition of 'infrastructural mapping' and 'infrastructural tourism' – as Shannon Mattern (2016) describes it – aimed at unearthing and uncovering urban and industrial infrastructure. Titles such as Kate Ascher's *The Works: Anatomy of a City* (2005), Brian Hayes' *Infrastructure: A Guide to the Industrial Landscape* (2014) and Harry Granick's classic *Underneath New York* (1991) all seek to expose the workings (and aesthetics) of hidden, overlooked, or enigmatic infrastructure in the city, resonating with media archaeological approaches to digital technologies and infrastructure (Mattern, 2017a, 2017b, 2018a, 2018b; Parikka, 2012, 2015).

Of course, all of this is not to claim proof of a deep conspiracy about governments' and corporations' intentions around locative media. In many cases, the design and implementation of locative media technologies are driven as much by accessibility and usability as political agendas. But they do point to a deeply ingrained tradition of repressing the materiality of locative media that in turn influences users' capacity to conceptualise and understand its social and political dimensions – something these infrastructural lines of critique seek to reverse.

Objects and Signals: The Performance of Locative Media

Geoffrey C. Bowker and Susan Leigh Star (1999) argue that infrastructure need not refer only to the kinds of heavy machinery, military hardware, underground cables, or industrial structures described above. For them, infrastructure is defined by what it *does* rather than what it is. In this way, file management systems, classification boundaries, and other forms of ‘sorting’ objects and information can also be understood as powerful infrastructures (see Vismann, 2008). This idea points to the subtle ways in which infrastructures support the performance of a set of relationships through which we can understand objects to emerge.

Like Bowker and Star, Timeto’s (2014) work on locative media also draws attention to their performative nature. She employs non-representational theory (see Thrift, 2007) and performance studies to more evenly conceptualise or ‘flatten’ the relations between the people, objects, and spaces at play in the enactment of location-aware technologies. Timeto argues for a stronger focus on the ‘processes and relations’ that unfold around locative media, in particular those that highlight the unstable and contingent nature of location-based networks. As she points out, locative media are always situational: they rely on wireless signals that are disseminated into spaces which consist of varying objects and environmental and geographical contexts, leading to infinitely diverse outcomes and experiences. Signals might be misdirected or disrupted; networks will function differently in each setting and location; and the connections between the people, infrastructures, and spaces in which locative media are enacted are always in flux (see also Southern, 2016: 191).

Timeto (2014: 95) argues for an understanding of locative media as a “‘hybrid’ situation of communication.’ She writes, ‘although repetition and automatism make locative media reliable, nonetheless they are not *expressions* but *performances* of the material infrastructure, which also always comprises instability’ (2014: 102, original emphases). This description of locative media as a ‘performance’ – deliberately harkening back to its artistic origins (2014: 95-6, 103) – acknowledges the co-constitutive nature of locative practices, recognising the connections and interactions that unfold between and amongst humans, objects, electromagnetic signals, and the environment in which they occur. Typically, disruptions and instabilities only come to the fore when people encounter them as errors or glitches in their use of locative

technologies.² But Timeto's work seeks to move this situational understanding of the performance of locative media beyond a human-centric understanding by developing an ANT approach, emphasising the ways in which media change the things they carry from one point to another, to the point that it becomes a mistake to theorise them separately (Latour, 2005). Such approaches decentre the chain of meaning-making away from the human. Within ANT and (to a less-emphasised extent) in non-representational theory, the human is reframed as merely one link in a chain of actions and interactions, rather than the driving agent that allows things to be known. The agency which we traditionally apply to humans is transformed into something that emerges through 'intra-action' between human and non-human agents (Barad, 2007; for related work see DeLanda, 2011).

This theoretical connection has been made just as prominently in artistic practices around locative media as the scholarship on it, as demonstrated by Farman's discussion of Simon Faithfull's project *0.00 Navigation* (2009). For the project, Faithfull travelled from the southernmost to northernmost points of the Prime Meridian in the United Kingdom. He is filmed by a super 8mm camera from behind as he pursues the Prime Meridian (0.00 longitude) across the English countryside, scaling walls, wading through canals, and even passing through people's houses to precisely trace its coordinates. Farman argues that by transforming his body into an object, a kind of 'cursor moving through space', Faithfull highlights the relations between non-humans and humans, or objects and 'body-as-object' – the human bodies represented as an object (a blue dot on a smartphone map) amongst other abstract objects – that is fundamental to the enactment of locative media (2016: 204).

Farman draws on object-oriented ontology (OOO) (Harman, 2007; Bogost, 2012) to propose the possibility of object-based phenomenologies. In contrast to an ANT approach, which Harman critiques for 'reducing these individual entities to their relations' (2010: n.p.), an OOO approach considers these objects – the GPS device and accompanying infrastructure, the camera, the 'obstacles' encountered by Faithfull, the Prime Meridian itself – to possess their own ontologies.³ Farman writes:

Objects themselves have a phenomenology: they have meaningful interactions with each other that produce space while often doing so without the intervention of human actors [...] while human agents

initiated these objects (and the ways in which they can address each other), they do so continuously regardless of human attention or intention (2016: 206).

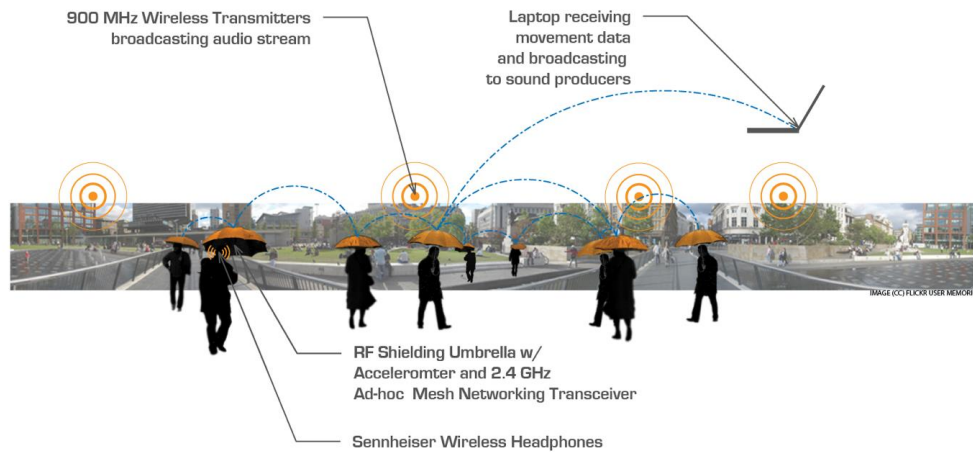


Figure 1. The *Herzian Rain* prototype drawing. Copyright Mark Shepard and used with permission.

Another artistic project that strongly emphasises the performative aspects of locative media art is Mark Shepard's *Hertzian Rain* (2009). In this piece, participants wear wireless headphones that receive sound from a central transmitter. They also carry umbrellas coated in foil that deflect electromagnetic signals. Through the reflective properties of these umbrellas, the ability of the participants to hear the sonic transmission is constantly being altered both by their position and the positions of the other participants. In another layer of complexity, the position of the participants is recorded by the system and the wireless transmission is adjusted in turn to progressively reveal and obscure the quality of the transmission (see Fig. 1 above). This excess of parameters creates 'unpredictable feedback loops' (Timeto, 2014: 96) within the system. Interactive installations are usually understood as being user-centered, with participants responding to a set of parameters that provide some sort of experience. Here the situation is reversed: users are merely another 'object' within a network of objects (material and immaterial) that interact, bounce off, and connect with each other. Such a project also draws on a de-centered ANT-influenced idea of networks. Each actant (transmitter, umbrella, headphones, participant, software) within the system is constantly co-creating the others. Nothing is able to act as an independent

contained object. Instead, each component is constantly emerging 'intra-actively' (Barad, 2007) with the action of the other parts of the system.

In *Hertzian Rain*, Shepard constructs his system to leverage stress and breakdown as key points in which meaning emerges. This focus is also evident in Nikki Pugh's ongoing *Colony* project (2011 – present). One artwork in this project, *Landscape-reactive Sashes* (2012-2013; developed with support from Fermynwoods Contemporary Art), has one participant walk with a GPS-enabled device, comparing the position calculated by two GPS modules. The other participants in the group each wear a sash containing a radio transceiver and a motor which vibrates in different patterns depending on the level of positional discrepancy detected and broadcast by the first participant's device (see Figs. 2 and 3 below). The project works to make the tools involved in providing a location fix profoundly visible. It also brings them into a relationship with the surrounding environment. As participants move around it becomes clear what types of physical environment allow GPS networks to function well and which create inaccuracies. This shows that 'rather than functioning as an abstract grid superimposed on the landscape, GPS is affected by the materiality of the spaces we move through' (Sawchuk and Thulin, 2016: 166).

In her analysis, Jen Southern connects *Landscape-reactive Sashes* with Barad's ideas of intra-action and entanglement, arguing that 'human and non-human agencies... are more strongly bound together in motion and action' (2016: 188). Pugh's project also works to give the participant a particularly embodied experience. Through vibration, they feel the workings and breakdowns of the infrastructure as it responds to the particular physical landscape they find themselves in. This also allows a relationship with GPS technology that is distinct from usual task-driven locative media applications. Here, the participant can feel the presence of the satellites as an ambient bodily process, something like a nudge or heartbeat. These projects by Shepard and Pugh illustrate, in a very embodied, material way, how the 'device' is never a seamless, unified object, but rather a set of relations and potential relations between interface, infrastructure, and user. In turn, they reinforce the considerable critical and creative power of approaches to understanding locative media that privilege – rather than obscure or overlook – the infrastructure, invisible connections, and other non-human components underpinning their operation.



Figure 2. The sashes worn by participants of *Landscape-reactive Sashes*. Copyright Nikki Pugh, used with permission.



Figure 3. The assemblage of ‘electronic innards’ used in the sashes for *Landscape-reactive Sashes*. Copyright Nikki Pugh, used with permission.

Next Steps: Rethinking Locative Media Materiality

These projects and the theorists we discussed earlier make a substantial contribution to overturning the long-running and deeply-rooted obfuscation of locative media materiality. Yet despite drawing on non-representational and non-human-centric approaches, these texts and artistic projects often remain, oddly, human centred – or rather, positioned in relation to the embodied presence of humans. Farman's discussion of *0.00 Navigation*, for instance, is revealing in the way it discusses a project that is quite bodily, as Faithfull's body and its movement across the landscape become the metaphor for the 'blue dot' that represents the human user on the device's interface. Southern's (2016) discussion of another of Faithfull's works, *Escape Vehicle No 6* (2004) – which transmits live footage from a weather balloon rising to the Earth's atmosphere – juxtaposes the project with Felix Baumgartner's jump from space in 2012, once again drawing on a bodily metaphor. Likewise, Shepard and Pugh literally use the human body – through devices worn or held by active participants – as the conduit for their projects' message.

In these works, and the critical discussions of them, the human body is often still the site at which the materiality of locative media, and its unstable and contingent nature, are made visible. This happens on both practical (through devices that interact with the body) and conceptual (through the human body as metaphor) levels. The body remains the *medium* through which this message is conveyed to users of locative media networks. Furthermore, by decentring and object-ifying the human body, such approaches and methods remain focused on revealing or excavating locative media infrastructure and performances *as they are* – in a primarily empirical, representative fashion. They are grounded in the limits of the body, or the physical movement of non-human elements such as electromagnetic signals. These limits are, at once, both physical and conceptual, and may block notions about what locative technologies might be or become in other non- or extra-human contexts.

Of course, it is impossible not to engage the human body in some way when making visible or encouraging understanding of locative infrastructure: it is always being made visible *to* or being understood *by* somebody – a dilemma that object-oriented ontology has consistently grappled with. But in the next section of the paper, we propose a further shift away from the human body as the focal point at which this recognition

occurs by considering the wider ecology of locative media on a grander – planetary and posthuman – scale. We position these debates about locative media infrastructure and performativity at the centre of speculative, narrative-driven approaches to understanding their presence in everyday life. This involves not merely revealing the infrastructure and making humans aware of its presence on a conceptual or bodily level. It also re-orientates the relationship between human and non-human elements, pointing to new and alternative materialities in future work within the field.

Speculative Approaches to Locative Media Materiality

In this section we argue that speculative approaches to engaging with locative media infrastructures can provide a powerful new perspective for existing technologies and practices. Such work is creative, but also contributes to research by working to ‘enrich and not only reduce the object of study’ (Asdal and Moser, 2012). In other words, it can potentially deepen contextual understandings of a research area, generating new perspectives and questions, rather than seeking answers for more narrowly defined problems.

Within such an approach, research methods themselves become active, engaged, and embedded with their object of study, rather than operating at a distance from it. Methods such as these must first seek the ability to address a subject area and then to engage with it, affecting the problem space (Lury and Wakeford, 2012). They reject the idea of method as ‘a set of short circuits that link us in the best possible way with reality’ (Law, 2005: 10). Instead, method is ‘a delicate act of creation, something that requires time and effort to make realities and hold them steady for a moment against a background of flux and indeterminacy’ (ibid). These views on method are strongly aligned with ANT approaches and typically understand the social as, in fact, being sociotechnical: something profoundly emergent with and through the materialities of technical and social relations. This generative understanding of materiality makes it a useful framework to advance questions of locative media materiality, offering to understand it from emergent, speculative positions. In what follows, we demonstrate this approach through two case studies: the ‘DIY Cultures in the Anthropocene’ workshop (2016) and *GPS Tarot* (2016-present). Following Law, our intention is to form a reality that takes in the often obscure actions of blackboxed infrastructures,

holding those actions steady for a moment to be examined, critiqued, and re-imagined. Both bringing in materiality and leaving space for speculation about extra-human agency is difficult to do in a single, off-the-shelf method. The tactic used here, therefore, makes case-specific first steps towards alternative understandings of locative infrastructures, using metaphor, story, and speculation as a bridge.

In taking this position, we draw again on Bowker and Star's work (1999). In their writing on infrastructural inversion, a process by which a concealed or blackboxed infrastructure are revealed, they suggest that an infrastructure, although hidden, can be felt through the 'texture' of its actions. Infrastructures often support other technical systems or practices and therefore these actions may well be indirect, making it a slippery thing to grasp. Keller Easterling describes the 'disposition' (a concept similar to Bowker and Star's texture) of an infrastructure's actions as 'not the pattern printed on the fabric, but the way the fabric floats [...] Not the object form, but the active form' (Easterling, 2014: 21). Bowker and Star (1999) suggest that, because of this indirectness, metaphor is an especially powerful means of describing infrastructural action. We would add that, in the fictive and metaphorical realm, there is also space to offer radical new perspectives to rethink human relationships to infrastructure.

Case Study #1: 'DIY Cultures in the Anthropocene'

'There has been a rift. A break between one civilisation and the next. A great forgetting. There has been no transfer between them. No passing on of knowledge or language. Only that which was stable enough to last without maintenance and repair remains.'

This is the scenario envisioned by one participant in a project organised as part of the workshop 'DIY Cultures in the Anthropocene', hosted by the Nordic Summer University. This event was driven by a desire to bring together technologists and people involved in DIY communities and permaculture to try and find common ground for projects which might emerge in a time of increased environmental and societal stress. The workshop, organised by one of the authors of this paper, Wood, had 10 participants walk around the workshop site (an abandoned paper mill in the Swedish forest) using an app called *GPS Test* which visualises the position of the GPS satellites overhead. Wood posed two questions to the participants: 'How might the satellites see the earth?' and 'How might the satellites operate after the society which

built them had died out?’ Both these questions were designed to un-think many of the assumptions built around an everyday technology such as GPS. These questions point to ideas around infrastructural inversion (Bowker and Star, 1999; Wood et al, 2017a), but use that inversion as a launchpad for speculation around alternative uses in a future scenario. After walking around the site for around 20 minutes, the participants were given paper and pencil and asked to respond to the questions through text and drawings.

The response by the participant quoted above (see Figure 4) demonstrated a powerful insight into the role these technologies play in our everyday lives, imagining what uses they might give rise to in a future where they are stripped of their current utility. In the post-apocalyptic scenario he describes, in which the GPS satellite constellation persists without any prior memory or knowledge of its purpose, satellites have come to assume an almost mythical, religious presence. The participant’s drawing shows a variety of different interactions with GPS signals (represented by numbers) in the absence of our familiar practices. Figures shelter from the signals in earthworks, priests collect them in a pyramid, animals speak to them, and people try to capture them with nets.

Such ideas point to the esoteric uses which were imagined in the early days of radio. Late 19th century pioneers such as Sir William Crookes understood radio as an etheric realm of communication between hidden voices without bodies. In this realm even speaking to the dead might be possible (Peters, 1999: 104–105). This (a)etheric understanding of the magical potential of radio is shared by the passage from Don DeLillo’s novel *White Noise*, quoted in our epigraph to this paper, in which the protagonist, an academic, is asked by his genius son to explain how radio works to a hypothetical group of pre-historic humans with no knowledge of modern technology.⁴ Like this passage from *White Noise*, the question posed to participants of the ‘DIY Cultures in the Anthropocene’ project about possible future uses of GPS prompts us to reflect simultaneously on the omnipresent role technologies have in our lives, and how little we understand about their material constitution and operation.

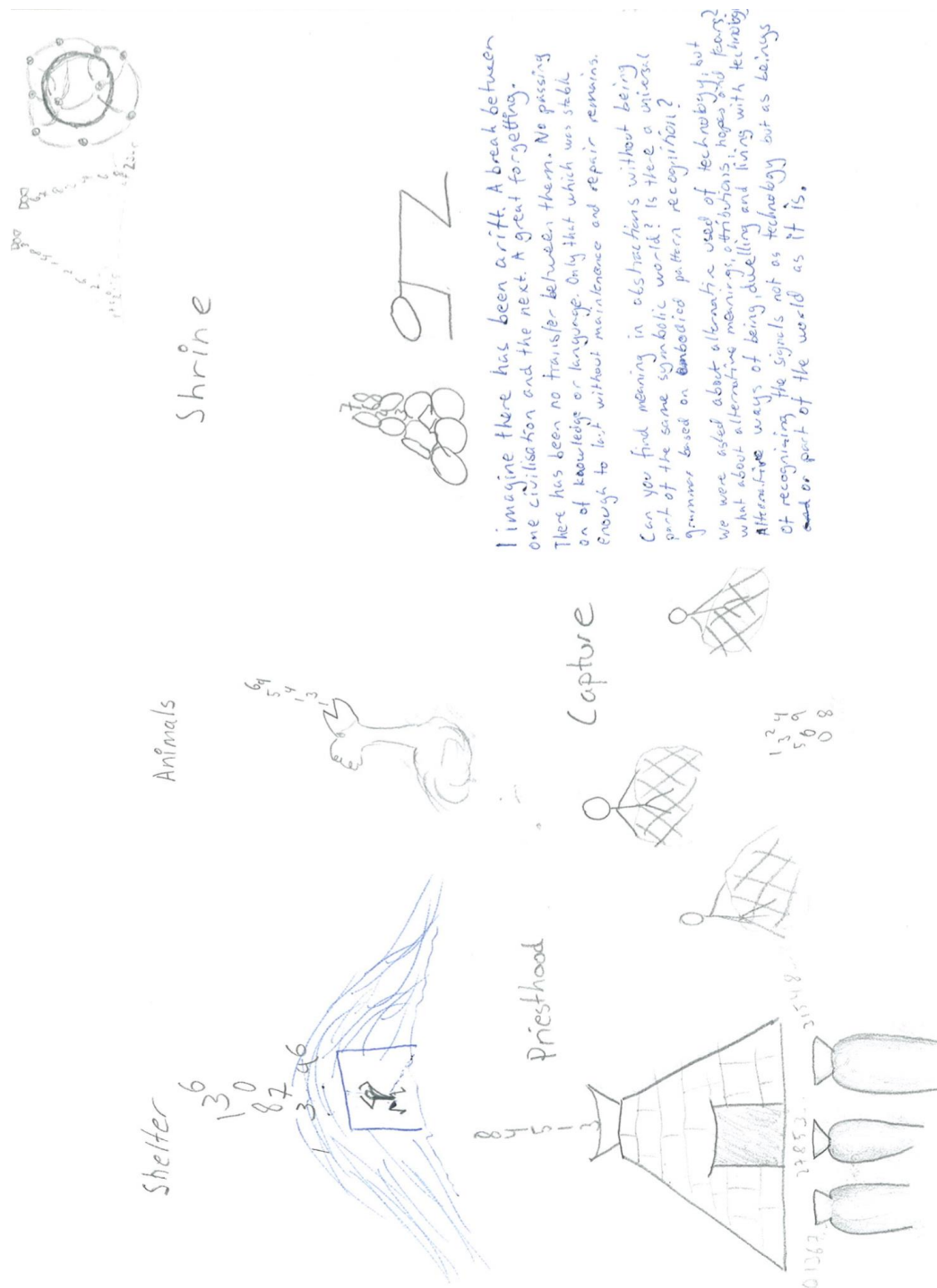


Figure 4. Participant drawing from the 'DIY Cultures in the Anthropocene' workshop. February 2016.⁵

Perhaps because of the open nature of the prompt, the participants returned a mix of responses. Some were pre-occupied with the present-day implications of government surveillance using location services. In response to the question, 'How might satellites see the Earth?', others were keen to emphasise that the satellites were just sending out signals rather than receiving any information from our devices. Because of this technical point, the idea that GPS satellites might 'see the earth' (as the workshop prompt suggested) was a misnomer, and that it was, in fact, a gross anthropomorphisation to imply that they are seeing or sensing the earth at all. Another participant was sceptical about the ability to forge new meanings from moments of infrastructural breakdown, stating that: 'the device is confused and the satellites didn't care.' Here, the perception that the satellites are remote beings who are not concerned with what is happening on earth (Parks, 2007) acts as its own form of speculation, opening up the possibility of what kind of existence they might be leading removed from earthly concerns. In the face of these mixed responses, Wood decided to treat this workshop as a first step and to develop a second workshop concentrating on the kinds of existence a network of satellites might develop whilst in orbit. This re-phrasing would mean the speculative satellites would not be under pressure to 'see' or otherwise be beholden to earthly or human concerns.

A second round of workshops took place at Queen Mary University of London. These workshops operated in a reduced form with a greater focus on the crafting of a speculation. They were attended by 10 engineers from a range of backgrounds, including three satellite engineers. The participants were organised into teams of two and asked to create a future scenario within the following projected world:

2050 Satellite Systems Become Self-Directing

After a series of technical advances and budget cuts on earth, in 2040 it is decided to remove ground support from the world's GNSS systems. Technical advances in machine learning mean that the system can maintain and correct itself to the standards required to support existing uses. The corrective model has been trained on existing use data (in terms of physical environment - terrestrial and extra-terrestrial, time, terrestrial navigation, military support). After 10 years, the system has continued to evolve and

begins to identify and work towards its own goals, both on the earth and in space.

Each group's response wrestled with the question of the satellite network's motivations. Typically, the first suggested motivation was survival. Participants assumed that the future satellite network would seek to sustain and propagate itself. One group proposed a scenario where satellites would meet in orbit and perform a kind of mating dance with each other to see if they were suitable partners. Having identified a partner, to reproduce they would break off some of their machine parts and combine them to make a new satellite. Another group proposed leveraging a current application of the GPS network: the use of GPS timestamps to synchronise cross-border financial trades. This group proposed that, to accumulate resources for themselves on earth, satellite networks from different countries would compete to rig the stock market for personal profit.

Other groups proposed more complex motivations. One saw the satellites as a force for the protection of earth, imagining that they would make a series of interventions to protect the environment from humans. Another group proposed the GPS satellites would work as part of a complex stack of machine-learning elements which would still, ultimately, be directed by humans. This final project did not see such a radical break with present combinations of human-machine infrastructure, rather that each element would be able to act more independently towards a shared goal. The goal they chose was the optimisation of farming, with the GPS network able to perform complex soil analysis to increase crop yields.

These participant responses are all grounded in speculation, but also work to interrogate present day uses of the GPS network. When the GPS network plays the stock market, it emphasises a little-known, but highly influential application of GPS. The project to increase farming yields understands GPS as one element in a wider infrastructural 'stack' in Benjamin Bratton's (2015) terms. In this stack, the nature of interaction between machine and human elements is made more complex and interconnected, resembling what Bratton (2016: 5) describes as an 'accidental megastructure' that nonetheless forms a 'coherent and interdependent whole' with infinitely conceivable applications.

Case Study #2: GPS Tarot

Wood sought to further explore such speculative methods in an exploratory project that builds on the one developed as part of the ‘DIY Cultures in the Anthropocene’ workshop mentioned above. The project, *GPS Tarot* (2016-present) (Wood et al, 2017b), involves tarot readings in which the cards are positioned according to the overhead positions of satellites. The readings are given either in person or via text message. Using a system developed over the course of the Sound Development City artists’ expedition, Wood reads one line of cards for events that are taking place in someone’s life, and another for their emotional trajectory.

These readings should not be understood as fortune telling. Rather than telling the future, they are telling the present. This shift is not least for technical reasons: because of the speed at which the satellites move, a reading taken an hour later will involve placing cards in different positions and may have a radically different outcome. In this way, the rapid orbits of the satellites (at least rapid relative to the earth) offer a different type of temporality in which the present is fleeting and any understanding gained from a combination of satellite signals can only be held for a moment. In many user-facing applications temporal disruptions such as this are smoothed over by corrective algorithms. But here they are taken as conceptually significant, resulting in a conception of the present, and the narratives around it, which is fleeting and unstable.

The project also interrogates one of the key design inscriptions of GPS today: the quest for greater accuracy. Readings are understood as interpretive and open-ended, not interested in giving an objective position in time and space, and certainly not one which comes from an object outside the environment in question. In this, it echoes the sentiment of Bruno Latour’s ‘geostories’ (2013), which are framed against those of NASA’s authorised narratives and visions of space. The external view of NASA’s planet science (and that implied by GPS mapping in all its forms) is abandoned in favour of one which is messy and open to multiple readings and interpretations. People who receive readings are entering into a different kind of hybridity, one in which the technical, emotional, and esoteric aspects of the practice intermingle so that these aspects can no longer be recognised on their own. This interdependence echoes the acts of ‘making kin’ proposed in Haraway’s (2016) call for acts of ‘worlding’, albeit in communion with technology rather than nature.

In *GPS Tarot*, a system from an alternative world is proposed: one in which GPS is used for spiritual as well as spatial navigation. This radical shift in the type of practices afforded by GPS takes us further away from our familiar uses and re-imagines the satellites as objects performing a different mode of address, one which we can hear if we listen in a different way. The project also uses the symbolic power of satellites to feed off a linguistic trick around their relationship with stars. An array of satellites is called a constellation, and, while people have long enjoyed multiple uses of star constellations for navigation, storytelling, and divination, the use of GPS satellites specifically has so far been more limited. Re-situating these satellites as objects of myth and divination imagines how they could be used in a different world, while at the same time questioning the uses we have for them in this one.

The project was developed on the *Sound Development City* artists' residency in 2016. Its starting motivation was a desire to develop an alternative mythology for GPS. The residency had set aside a provision for local fixers to connect artists with practitioners in Madrid. Wood requested to be placed in contact with psychics and fortune tellers hoping to speak to them about potential overlap between their practices and the symbolism of the GPS network. Unfortunately, local psychics were difficult to find so he bought a deck of tarot cards and set about teaching himself. The resulting system proposes an alternative reading system rather than an alternative set of cards that would form an indexical relationship between particular satellites and particular cards. A spread of cards is arranged in a way that matches the overhead positions of GPS satellites, then two lines are read in the chart; one for events and one for emotions. In this way shifting satellite positions influence the nature of these two lines. This influence is felt both in terms of the number of cards picked (dependent on how many satellites are in view) and the position of the cards in the spread (dependent on satellite positions). While the lines read in the chart remain consistent across readings, both the number of cards, and the relationship between cards inside and outside the reading lines can be highly influential.

The project has not been subject to formal user testing, having been distributed as an artistic project through two modes: gallery exhibitions and the less formal route of business cards which pass from hand to hand (see Fig. 5 below). Since the project's inception in autumn 2016, over 100 readings have taken place over text message and

in person. In the readings, Wood emphasises the importance of not understanding the outcome as a prediction of the future, but rather as a way of re-evaluating the present; the satellite network is extremely dynamic, with each GPS satellite orbiting the earth twice every 24 hours. The satellite positions which form the readings are therefore extremely temporary and fleeting, understood in the spirit of John Law's call to 'to make realities and hold them steady for a moment against a background of flux and indeterminacy' (2005: 10; see Fig. 6).



Figure 5. *GPS Tarot* business card for readings over SMS and WhatsApp.

In terms of reception, participants typically reported interest in the GPS system, but took a greater interest in the context created in the reading for them to reflect on the narratives taking place in their lives. Tarot readings are, in part, a way of forming speculative narratives which people can compare to their hopes and expectations. This adds another speculative layer to the work, creating both a speculative re-understanding of GPS satellites and speculation about participants' lives. Informally, most participants have described these as 'helpful', 'useful' or 'wonderful'. In 10 cases, Wood has done follow-up readings in the weeks following the initial contact. In this way, even if the project is not creating directly traceable critical or pedagogic outcomes regarding the operation of GPS, by acting as a poetic anchor or hook to the project the GPS network is still able to act in a new and engaging way and create new narratives and meaning for users.



Figure 6. A spread of cards in a reading. Note the matching arrangement of overhead GPS satellites as seen on the GPS Test app (top centre).

Speculation, Locative Media, and Rethinking the Posthuman

Both exploratory projects described above work to interrogate and complicate the ontological position of the GPS network. By ontological position we mean how the GPS network acts, what it signifies, and how a combination of those two things can enrich and deepen our understanding of what the network is and could be. This 'zooming out' provides a broader perspective and taps into speculative methods that dramatically de-contextualise the understandings of GPS built up through our everyday sociotechnical practices. The results are unlikely to lead to realised future technologies or mainstream reconfigurations of these networks and their implications.

But they do provide alternative ontologies through which to understand the existence and influence of locative media infrastructures.

Smartphone proliferation is running at unprecedented levels and computation and sensors are being embedded into more aspects of our environment, fundamentally altering and ‘reprogramming’ how we connect, act, and conceive of the world around us (Bratton, 2015; Gabrys, 2017). As Parks’ (2007) and Graham’s (2016) work illustrates, there is a growing disparity between, on the one hand, the prominent role these technologies play in our lives and their critical role in human development and progress; and, on the other, our capacity or willingness to understand how they work. In this context, ‘world building’ techniques such as speculative fiction point to how the stories we tell about the world can provide new insight into our relationship with an established technology like GPS.

By placing locative technologies in different scenarios, we can get further away from established, instrumental understandings of their use. Symbol and story can provide useful tools for considering the different spatialities, temporalities, and materialities which GPS infrastructure may hold, offering ways to radically re-orient the relationships between satellites, infrastructures, environments, users, and applications. Stories can also act as descriptors of the ‘texture’ (Bowker and Star, 1999) of an infrastructure, providing ways to think about the material actions as they support and influence our practices. However, attention to story and metaphor can also prompt a questioning of these technologies beyond the bounds of merely understanding how they work, opening up an approach that also encompasses what they might become in future or alternate trajectories.

The use of speculation has a strong lineage in design practices, from established tools such as scenarios and personas to increasingly mainstream fields of speculative fiction and speculative design. Design forms a foundational part of any technical system, particularly in regard to which roles and modes of use emerge. When they place particular affordances into objects or systems, designers ‘inscribe’ modes of use which may in turn construct the type of user which interacts with a system (Akrich, 1992). Fictional approaches can open up established inscriptions, allowing designers to ‘become more like authors, drawing from the narrative space of electronic object misuse and abuse to create alternative contexts of use and need’ (Dunne, 2008: 64).

In formulating their approach, Dunne and Raby (2013) were inspired by the work of authors such as Margaret Atwood. Atwood often works with narratives set in the future. She has proposed her work as speculative rather than science fiction, putting the stress on the creation of a speculative world rather than the technofutures implied by 'science' fiction. Dunne and Raby endorse this and understand Atwood's world-building work as the gold standard for their 'authorly' design approach. Speculative design approaches are acts of world building, crafting spaces which are familiar, but where some key relation or object has shifted in use and meaning. They thereby provoke reflection and discussion, both about the present day and our possible future relations with technologies (Auger, 2013). Widely circulated speculations (such as Google's early 'Glass' videos) may also provide material for the sociological study of emergent publics and emergent human/non-human relations (see Galloway, 2013).

Indeed, speculation may lead us to think through more than discreet technologies. It is now widely understood and accepted that we are entering the Anthropocene, a time when the world has been dramatically re-shaped as a result of human action. In such a moment, where human action has begun to re-shape complex planetary climatic systems, Latour (2013) calls for emerging 'geostories' which can rival NASA's blue planet image of a world viewed from the outside. Such stories would allow us to be more submerged and implicated in our surroundings (inhabiting the 'anthro-' of the anthropocene), rather than taking a position visually and conceptually external to it. As environmental conditions begin to shift in this new era, coupled with overpopulation, human presence on the earth will likely become more precarious. In this world of transformed relations and materialities, it will be less possible to view humans as distinct from nature, with them having transformed it in their own image. Fiction is a powerful tool for understanding how we might inhabit such a world, as the 'DIY Cultures in Anthropocene' workshops indicate through their combination of written and visual storytelling.

Donna Haraway (2016) has called for a response to the anthropocene (or in other terms, the Capitalocene or Plantationocene) which involves practices of 'worlding' to project ways in which we can 'make kin' through working with other species and technical actors, so that all can continue to inhabit planet Earth. For Haraway in particular, through her concept of 'double vision', story and speculation are used more

actively, not only as descriptors of sociotechnical practices, but also as engaged proposals for better alternative worlds (Haraway, 1991). Similarly, in her critical understanding of what it means to live in the Anthropocene, McKenzie Wark (2015) draws extensively on science fiction writers Andrey Polonev and Kim Stanley Robinson, who describe stories of climate engineering and terraforming. And lastly, recent novels by Neal Stephenson (2015) and Liu Cixin (2008) that explore the possible roles that satellites might play in determining the future existence of humans beyond life on Earth provide frameworks for thinking through alternative uses of GPS infrastructure. All these examples show how imagination is key in theorising a world in which the established environmental order (and, thereby, some of our established understandings of materiality) is being dramatically disrupted, and in which, to be successful, we will have to radically re-think our existing practices.

The Potentialities and Limits of a Speculative Approach

Speculative approaches like the case studies and related examples outlined above offer a strong potential to rethink our sociotechnical practices around GPS, drawing attention to the ways we both *do* and *might* use the technology. We would, however, go further, arguing that speculative approaches have the potential to shift the ontology of locative technologies. By this we mean the way the technology acts without being filtered solely through human-to-human applications, and, from this shift, what the technology could symbolise as both a technical and cultural infrastructure.

In an attempt to engineer such a shift, the projects mentioned here find kin with Benjamin Bratton's 'Stack' (2016), a detailed and complex reimagining of global technical infrastructures which understands users as being another layer in the stack. These users are not necessarily human and are, therefore, more flexible ontologically than a user in the widely used Weiserian-ubiquitous computing sense (Weiser, 1994). Another reference point is Martin Dodge and Rob Kitchin's *Code/Space* (2011) which highlights the power of software code in organising space and optimising its use towards contextually specific goals (for example a check-in desk and boarding gate at an airport). In this way, Dodge and Kitchin argue, technical infrastructures produce – indeed, fundamentally make possible – everyday life. Bratton would arguably be more comfortable with the associations of the word 'speculation' – he has, for instance,

written a novel, *Dispute Plan to Prevent Future Luxury Constitution* (2015) which blends theory and fiction. But both his and Dodge and Kitchin's approaches show the advantages of using theory to re-think our understandings of the ontology of technical infrastructures. Such work also has the potential to reach out beyond the academy through creative undertakings such as fiction writing or artistic installations.

The two projects and the speculative approach we have outlined provide the first steps towards supplementing the existing scholarship and artistic practice around locative media materiality. We wish to build on the work already undertaken by artists and scholars that have made crucial steps towards a less human-centric understanding of location-aware technologies. But we also want to fill in some of the gaps left by this existing literature – namely, its persistent reliance on the body as the method and metaphor for rendering visible this materiality; and its emphasis on revealing locative media materiality as it is, not as it might alternatively be. What we propose through our discussion of Wood's two projects is a shift towards an approach that, in addition to embracing the messy, contingent, and very material nature of locative media, opens up new ways for understanding them through speculative – creative and questioning – means.

This speculative approach builds on and supplements existing approaches to locative media materiality in two key ways: it is *creative* in the sense it more explicitly encourages metaphor and imagination beyond the human body; and it is *questioning* rather than purely empirical. First, by embracing imagination and creativity, a speculative approach to locative media materiality introduces a much wider range of metaphors, narratives, and imaginings to understand the presence of satellites and location-aware technologies and infrastructure on the planet. As Liam Cole Young (2017: 19) points out, 'it's rare that [media studies scholars] incorporate *imagination* into our scholarship and teaching. It seems to lack the empirical or analytical rigour that we demand of ourselves and our approaches. Our default setting is to be cold and diagnostic, safe in our critical and historical distance'. By engaging users of locative technologies in stories and designs that visualise, critique, reimagine, or fantasise about the technological assemblage and processes of locative media, it situates them in a new light. This new light can generate more critical understandings of how infrastructures act to influence sociotechnical practices through an examination of infrastructural 'texture' (Bowker

and Star, 1999). The creative work at play in these speculative techniques can also act as a first step to thinking beyond those practices and the ontologies they encode, leaving space for new relationships with technical assemblages at large. Such an approach also shares affinities with media archaeology-influenced approaches to ‘imaginary media’ (see Kluitenberg, 2006) and ‘media anarchaeology’ (Zielinski, 2006), which eschew traditional media history in favour of alternate, multifarious, and speculative understandings of emergent, imagined, and unrealised media technologies.

As the projects above illustrate, by reconfiguring satellites outside their conventional representation and use they become a site for reflection, imagining, and alternative functions or uses. In the process, this approach helps to further illustrate the infrastructural and performative layers of locative media from a non-human-centric perspective in a way that is even further distanced from the body as the metaphor or site for this understanding. It does this by engaging creatively with locative media infrastructure – from satellites to signals, and everything between – through stories and designs that centre on these objects and processes themselves, rather than the users of them.

Second, by raising questions about the material presence of locative media rather than providing answers, a speculative approach is less reliant on purely technical or empirical knowledge. Instead of simply describing in a dry fashion how GPS satellites and smartphones currently function, it opens up participants’ imaginations to alternative and non-empirical understandings, based on speculation and fantasy rather than solely fact. As a result, it is able to expand beyond the limitations of simply understanding how this infrastructure and its performance works or unfolds, and allows for playful imaginaries about how they might function in a future or alternate world. Speculative thinking about technologies – as illustrated by the novels of Atwood and Stephenson, or the artefacts of Dunne and Raby – takes into account what could happen with them outside the bounds of our existing knowledge or understanding. As Galloway (2013: 56) puts it, this provides ‘the opportunity to recognize not just what things are but also what they might yet become – for better or worse.’

This is particularly important for GPS because of its entanglement in almost every aspect of human existence in the present – from people’s social lives and mobility to the operation of critical infrastructure like agriculture, transportation, military

operations, and global financial markets (Milner, 2016). In this context, Bratton's, Haraway's and Wark's work around planetary computation and the Anthropocene provides a challenge to move away from a human-centered perspective towards a more complex understanding of humans' presence on the planet today. In a world which has been profoundly re-made through human action and networked computation it is no longer possible to see humans as separate causal agents. As human life becomes more precarious on this planet, the agency of non-human actants begin to take on a new meaning, as we begin to imagine a literally post-human planet. With growing awareness of the dire consequences of climate change, waste, and the destruction of natural habitats (Kaza et al, 2018; Steffen et al, 2018; UN, 2019), projects like 'DIY Cultures in the Anthropocene' and *GPS Tarot* create small but necessary spaces for understanding the more-than-human role of these technologies. They allow, as participants of *GPS Tarot* reported, for reflection on these technologies' presence beyond their own lives, to move beyond utopia and dystopia as frames of reference and help address what Bratton (2015: xviii) describes as the 'lack [of] adequate vocabularies to properly engage the operations of planetary-scale computation'.

Yet these projects are, by their very nature, small-scale – funded as they are through academic and artistic channels – particularly when considered against the weight of the issues they are grappling with. Like most locative media art projects, they reach only a handful of participants – likely already liberal-minded and inclined towards contemporary and experimental art – in one site or city at a time. In this sense, we do not claim that these projects have or could bring about a mainstream or widespread shift in understanding locative media materiality. Instead, we posit them as exploratory examples of how locative media art and practice might intersect with scholarship to introduce elements of speculative fiction and design, story-telling, and world-building into their participants' and users' experiences and understandings of locative technologies.

We also acknowledge that the two projects discussed here are, inevitably, still bound to the human body, since they require physically present, embodied participants like those of *0.00 Navigation*, *Hertzian Rain* and *Landscape-reactive Sashes*. This is an inescapable outcome of the artistic nature of such projects, centred as they are around the discourse of engagement and participation. These projects, however, gesture

towards an ontological repositioning of these technologies away from bodily interaction – through user-centred devices like sashes and umbrellas – and more towards the speculative, imaginative, and conceptual rethinking that other speculative works in design, fiction, art, and the moving image allow. They still require human presence and input in the form of drawings or gatherings around the tarot reading table. But they also decentre the human body in the process, shifting their participants' perspective both spatially – from the local to the planetary – and temporally – from the present to alternative and future trajectories.

Lastly, we acknowledge the limitations of speculation and imagination themselves within art, design, architecture, and performance. As Galloway (2013: 58) points out, speculative design, like science fiction, often remains tethered to the present. She quotes Carl DiSavlo: 'Even as speculative design expresses alternatives it references, often mimicking, the status quo and replicates the various styles and themes of the moment. Because of this, close examinations of speculative design projects offer us a view of the present reinterpreted and in relief' (2012: 2). Galloway contends, furthermore, that speculative design works still struggle to leave the art gallery or exhibition space; can be just as 'normative and prescriptive as traditional, or "affirmative" product design'; and often rely on viral marketing techniques to gain wider traction (2013: 57-8). Galloway seeks to address these shortcomings more broadly by drawing attention to the production process itself within speculative design. She proposes a set of critical questions about process, drawing attention to the way speculative design is crafted and disseminated (2013: 61-2). These critiques are important, but we aim instead to explore more deeply how speculative fiction and design can explicate the materiality of locative media. By drawing on a combination of theory and practice we seek to challenge, reconfigure, and decentre existing understandings of the assemblage of human and non-human actors imbricated in the operation of locative media technologies, opening up avenues for further examining the possibilities and limitations such an approach affords.

Conclusion

In this paper we proposed a modest intervention into debates around locative media materiality that we hope will encourage debate and criticism about the various methods for understanding these technologies. We have not explicitly sought to address the

question of how to convey this understanding to a broader range of users beyond the limited scope of scholarly literature and artistic projects, as this is a much larger topic for another paper. Nonetheless, speculative fiction and design, we argue, provide a rich means of problem-forming which can be of use to designers and also to users whose practices consist of adapting, reforming, and re-interpreting locative technologies.

Such work requires profound addressability (Lury and Wakeford, 2012) to the object of research and, to achieve this, we recommend that speculative methods get involved with the work of problem-forming by critiquing existing understandings of locative technology and its boundaries. Through a destabilisation of our contextual assumptions, speculative methods are particularly effective at questioning the ways locative technologies can be and act. In doing so, they aim to thicken these understandings in a way that inspires new questions and perspectives. Such enrichment of the object of research can take us beyond existing paradigms offering beneficial new perspectives for researchers, designers and users. In practical terms, the question remains how to address some of the shortcomings around speculative fiction and design as an approach, as well as to mobilise these techniques beyond the realm of artistic events and workshops and into the wider public realm of understanding about locative media.

Acknowledgements

The authors would like to thank Benjamin Nicoll for comments on an earlier draft of this paper (although all mistakes and oversights are our own); Mark Shepard and Nikki Pugh for kindly giving us permission to include images of their works; and all the reviewers of this paper for their exceptionally helpful comments.

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Notes

- ¹ We note that the term GNSS (Global Navigation Satellite Systems) may be more appropriate here as a collective name for the American GPS system, the Russian GLONASS system, and the Chinese Beidou system, among others. However, we have decided to use the more familiar, colloquial term 'GPS' to refer to all these systems.
- ² Such blocks or disruptions in the performance of locative media can be caused by any number of factors. The most common environmental factors include buildings that block the receiver's 'view' of the sky or cause signals to bounce off surfaces before reaching the device, preventing or delaying it from getting a location fix from the GPS satellites above; or differences in air humidity that can alter the speed at which signals travel. Corrective algorithms can mitigate these effects, but the receiver's ability is always subject to such changing conditions. Milner (2016: Ch 6) also notes how GPS is vulnerable to deliberate disruption, such as jamming (i.e. truck drivers using signal jammers to prevent

companies from tracking their routes) and spoofing (devices or apps that generate a fake GPS signal which replaces the real one, fooling GPS-enabled devices and objects into thinking they are elsewhere). Such factors illustrate the extent to which GPS should be understood as a profoundly environmental and temporal infrastructure, as well as a spatial one.

³ A deeper explanation of the distinct genealogies and positions of ANT, OOT and related fields is beyond the scope of this article. But briefly, Barad's work (2007) and other ANT-influenced approaches focus less on the ontologies of objects, demonstrated by their phenomenologies, and more on the actions that we ascribe to objects. In ANT terms, discreet, contained ontologies of objects appear to come about through repeated actions. These actions are not causally necessary, but may occur frequently enough to give rise to seem ontologically firm and immutable. Ontology, such as it is, should rather be understood as constantly emerging through a network of actions and interactions.

⁴ In this passage, the protagonist of *White Noise* (DeLillo, 1998: 148-9) is asked by his son, 'What is a radio? What is the principle of a radio? Go ahead, explain. You're sitting in the middle of this circle of people. They use pebble tools. They eat grubs. Explain a radio.' The protagonist responds, 'There's no mystery. Powerful transmitters send signals. They travel through the air, to be picked up by receivers.' To which his son replies: 'They travel through the air. What, like birds? Why not tell them magic? They travel through the air in magic waves. What is a nucleotide? You don't know, do you? Yet these are the building blocks of life. What good is knowledge if it just floats in the air? It goes from computer to computer. It changes and grows every second of every day. But nobody actually knows anything.'

⁵ The full text of the drawing reads: 'I imagine there has been a rift. A break between one civilisation and the next. A great forgetting. There has been no transfer between them. No passing on of knowledge or language. Only that which was stable enough to last without maintenance and repair remains. Can you find meaning in abstractions without being part of the same symbolic world? Is there a universal grammar based on embodied pattern recognition? We were asked about alternative uses of technology, but what about alternative meanings, attributions, hopes and fears? Alternative ways of being, dwelling and living with technology. Of recognising the signals not as technology but as beings or part of the world as it is.'

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